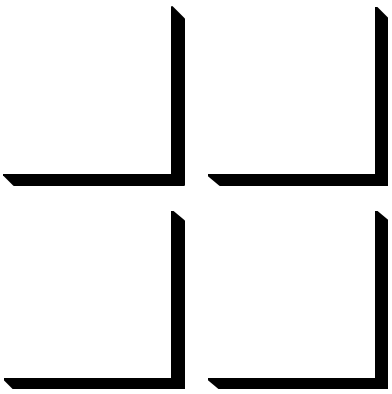

APPENDIX: J

FLOODPLAIN MANAGENT ASPECTS

Of the Elmwood Development

BACKGROUND

Major portions of the proposed Elmwood project are in the 100-year floodplain as defined by FEMA (Federal Emergency Management Agency). The development may be considered as consisting of three separate but somewhat interconnected pieces: the portion east of Abel Street; the residential portion west of Abel Street; and the commercial portion west of Abel Street.

The commercial portion west of Abel Street is approximately rectangular in shape and parallels the I-880 freeway. This piece is approximately 500 feet in the east-west direction (from the Elmwood Correctional facility access road to the east to the I-880 freeway to the west) and 2000 feet in the north-south direction (from existing industrial uses to the north to Great Mall Parkway to the south.)

The residential portion of the project that is west of Abel Street abuts the commercial piece to the west and runs easterly all the way to the earthen levee along the west bank of Lower Penitencia Creek. This creek is a flood control channel under the jurisdiction of the Santa Clara Valley Water District. This residential portion of the project is approximately 500 feet wide and abuts an 80-foot Hetch-Hetchy right-of-way on the south side. The northern boundary is the back of existing single family residences that front on Sylvia Avenue.

Lower Penitencia Creek is one of the primary sources of flood waters in the local area. The creek itself consists of approximately 4 miles of channel within the City of Milpitas and drains an area of about 27 square miles (at the I-880 crossing). Added to the flood sources are upstream overflows from Upper Penitencia Creek and from Berryessa Creek. Flood waters travel in a downstream direction and co-mingle in the vicinity of the proposed project.

The FEMA (Federal Emergency Management Agency) FIRM (Flood Insurance Rate Map) for the site was reviewed. The FIRM is Panel 3 of 4 for the City of Milpitas. The 1998 FIRM, designated as "060344 003G," shows the site east of Abel Street has having a 200-foot zone of sheet flow flooding 1-foot deep. The portion of the site between the Great Mall Parkway on the south to the existing developed area to the north is shown as subject to sheetflow flooding – that is shallow flooding – to an average depth of 2 feet.

At the southern end of the existing development north of the project site, the water surface elevation is shown as 20 feet NGVD (National Geodetic Vertical Datum.)

The published discharges along Lower Penitencia Creek have not changed from those published in the 1986 Flood Insurance Study report for the City of Milpitas.

In 1984 the Santa Clara Valley Water District constructed flood walls and levees along Lower Penitencia Creek from the southern entrance to Elmwood downstream.

Sometime after 1984 and before 1997 a second, northern entrance to the Elmwood Correctional Facility was constructed. The Santa Clara Valley Water District (SCVWD) required a 0.5-foot raising of the floodwall and levee upstream of that newest crossing of Lower Penitencia Creek. This floodwall raising was verified by field inspection. However, no backup data could be located by the District staff and no such data was included in the SCVWD hydraulic model.

From 1997 to 1999 a series of Letters of Map Revision (LOMR's) were issued by FEMA for the Summerfield Tracts upstream of the newly constructed Great Mall Parkway. While the structures were shown to be above the 100-year flood elevations, the floodplain was not changed to reflect these LOMR's.

The 1997-1999 LOMR's were all developed having 1,200 cfs flow down Lower Penitencia Creek downstream of Great Mall Parkway and 1,200 cfs flow through the Summerfield subdivision and along Great Mall Parkway. This later 1,200 cfs flood water ultimately flowed under Great Mall Parkway and under a street stubbed to the north. A series of 10, 12' wide by 4' high reinforced concrete box culverts were constructed as part of the Great Mall Parkway interchange from I-880 so that the 1,200 cfs that didn't fit into Lower Penitencia Creek would be discharged to the area between I-880 and the Elmwood Correctional facility parking lot.

The existing hydraulic models for Lower Penitencia Creek consisted of an HEC-2 model from the original (1976) Flood Insurance Study and a 1991 HEC-2 model developed by the SCVWD which included the wall constructed in 1984.

The known flooding sources at the site included: the sheetflow on the portion east of Abel Street; and the sheetflow coming under Great Mall Parkway and proceeding through the commercial and resident sites west of Abel Street to flow into the existing residential and industrial uses north of the project site.

The Lower Penitencia Creek channel was constructed by the SCVWD and appears not to have been considered by FEMA in constructing the flood maps. Even though this creek is now leveed and walled, the question remains whether the floodwaters contained by this project are still a source of flooding to the project. This question will be addressed in the section immediately below entitled "Channel Capacity."

CHANNEL CAPACITY

The hydraulics in Lower Penitencia Creek were modeled to determine a) the existing conditions water surface elevations in the creek, and b) the approximate head loss due to the addition of a proposed bridge which would connect the planned development to Abel Street.

The basic information used to create the hydraulic model for Lower Penitencia Creek came from two sources. Cross sections 8849 to 15226, corresponding to the reach between Marilynn Drive and the original (the southern) Elmwood Correctional Facility entrance, were taken from the SCVWD's "design model" from 1991. (The flood walls were constructed in 1984.) Cross sections 15345 to 20100, corresponding to the reach from upstream of the south Elmwood entrance to the confluence of East Penitencia and Lower Penitencia, were taken from the original (1970's) Flood Insurance Study model. Field measurements were taken of all bridges from Marilynn Drive to Main Avenue to verify the accuracy of information in the model. The north Elmwood entrance bridge at cross sections 14273 to 14323 was added into the model using field measurements of the bridge and the closest upstream and downstream cross section geometry. The model was modified to incorporate the effects of pressure flow under the various bridge crossings using the HEC-2 special bridge method, which was not used in the original SCVWD model.

Table 1 shows the in freeboard (top of wall or levee elevation minus the elevation of the 100-year flood at the same location) on the flood walls and levees at various places along Lower Penitencia Creek as shown in the original SCVWD model and in a model that was revised to more accurately account for culvert losses.

The original SCVWD model envisioned generally more than 2 feet of freeboard and sometimes more than three feet. The revised model, however, is a truer picture of the freeboard situation. The freeboard is always less than 2 feet and upstream of the original (southerly) Elmwood entrance bridge the freeboard is less than one foot. It must be noted, however, that the channel upstream of the southerly Elmwood entrance is not leveed or walled, but is an incised channel and as such freeboard is not a FEMA issue.

The upgrading of the Water District model was then extended to conform to the FEMA discharge of 1, 200 cfs throughout the reach. The results are shown in the table under the column labeled "Revised SCVWD Model FEMA flows." The negative freeboard values indicate that the water will not fit inside the channel and overtopping may occur.

TABLE 1

FREEBOARD ALONG LOWER PENITENCIA CREEK

Discharge Upstream of Calaveras Blvd.			**Freeboard (feet) 1,050 cfs**	**Freeboard (feet) 1,050 cfs**	**Freeboard (feet) 1,200 cfs**
Street	**Channel Station (ft)**	**Elevation of Bank/Wall (ft)**	**Original SCVWD Model**	**Revised SCVWD Model**	**Revised SCVWD Model FEMA Flows**
Marylinn Dr.	8887	17.4	1.8	1.7	1.7
Calaveras Blvd.	11278	18.3	2.1	1.6	1.6
Serra Way	12077	18.7	2.1	1.6	1.5
Shop Ctr. Drive	12319	19.2	2.4	1.6	1.4
Junipero Dr.	12729	19.7	2.6	1.4	1.0
Corning Av.	13275	20.5	3.4	1.3	0.5
Sylvia Av.	13479	20.9	3.2	1.0	-0.1
Elmwood North	14323	21.9	N/A	1.4	0.2
Elmwood South	15206	21.5	2.5	0.5	-1.1

FEMA requires at least 3 feet of freeboard along earthen levees and never less than 2 feet of freeboard along non-earthen structures; however, FEMA usually requires 3 feet even along non-earthen structures. As there is not sufficient freeboard along the flood control project and as there appears to be overtopping given the FEMA 100-year discharges, Lower Penitencia Creek overflows must be considered to be a source of flooding to the project.

If the complete levee is considered to be removed to natural ground (the conditions that FEMA requires for levee projects that are not certified as being capable of containing the 100-year flood), there is at most 100 cfs that would overflow from Lower Penitencia Creek onto the site. This 100 cfs must be considered a flooding source to the project components west of Abel Street.

Additional hydraulic work was done with a proposed bridge located mid-way between Sylvia Avenue and the northerly Elmwood entrance bridge. This bridge was found to increase the water surface elevation by, at most, 0.2 feet and generally less than 0.15 feet. To mitigate this very small impact, it was proposed that a small, 0.2-foot diameter aluminum railing be adhered to the top of the flood wall upstream of the proposed bridge and that the levee upstream of the bridge be raised by 0.2 feet.

FLOOD POTENTIALS, IMPACTS AND MITIGATIONS

There are five potential flood sources for the site. The first is the sheet flow that crosses the portion of the project east of Abel Street. A computation based on normal depth of the 200-foot wide flood path at a depth of 1 foot yielded a discharge of 370 cfs. This discharge must be accommodated with the placement of the buildings and grading on the east side of Abel Street. This discharge must be able to flow through the site in approximately the same location as shown on the FIRM and discharge to Abel Street where the flood waters would then flow northerly on Abel Street. Some of these flood waters can impact the site located westerly of Abel Street. These will be discussed under the fifth source.

The second source of floodwaters is from the sheet flow coming from the east as its travels down Abel Street. As these flood waters travel down Abel Street toward Calaveras Boulevard portions will flow off toward the west as they pass each opening in the flood walls at the intersecting streets such as: the northern entrance to Elmwood, the proposed new crossing of Lower Penitencia Creek, Sylvia Avenue, Corning Avenue, Junipero Avenue, etc. At the site these flows will be on the order of magnitude of 50 cfs flowing through each street opening from Able Street toward the site.

The third source of flood waters is the 1,200 cfs that flows northerly from near the intersection of I-880 and Great Mall Parkway. This discharge must be accommodated as it makes it way northerly toward the existing developments to the north. It will discharge against the backwater noted in the third source.

The fourth source of floodwaters is from Lower Penitencia Creek between the end of the existing subdivision to the north and the northerly Elmwood entrance bridge. If the levee along the western bank of the channel is "removed" approximately 100 cfs would flow toward the project site.

Source 1 – Sheetflow East of Abel Street

A park will be constructed in path of the sheetflow. This will keep the flooding the same as it is today. In addition, the land adjoining the park will be parking lots which will be able to contain flood flows should overflow from the park occur. The structures built on the east side of Abel Street must always be a minimum of one foot (two feet in Milpitas to meet the City's more stringent criteria) above natural ground and a minimum of one

foot (2 feet in Milpitas) above the nearest crown f Abel Street. The Abel Street crown criterion is due to the fact that the 370 cfs will turn northward down Abel Street and will flow to a depth of approximately 1 foot above the crown.

Source 2 – Sheetflow from Abel Street

The 370 cfs that would flow northward down Abel Street toward Calaveras Boulevard would be at a depth of approximately one foot over the crown of Abel Street. As Lower Penitencia Creek is immediately to the west of Abel Street, and as the creek has a floodwall adjacent to the sidewalk along Abel Street, whenever an opening in the floodwall occurs to allow for cross street traffic, flood waters can also flow through those openings and proceed to flood properties to the west of Lower Penitencia Creek.

The proposed development has two potential openings that could direct water toward the site west of Abel Street. The first such opening would be the new bridge crossing proposed to be constructed between Sylvia Avenue and the existing northern Elmwood entrance bridge. This proposed bridge, however, would be set at a slope such that the roadway on the west side of the creek is 3.5 feet above the centerline of Abel Street. Therefore, no sheet flow could cross at this location.

The existing northern Elmwood entrance bridge could, however, conduct sheet flow from Abel Street to lands to the west. Approximately 45 to 50 cfs would flow though the opening in the floodwall and proceed to the west. Under existing conditions this flow would join flow coming from under the Great Mall Parkway and proceeding down the open field between the Elmwood Correctional facility and I-880.

To prevent flooding from this source after the project is in place, it is proposed to go onto the Elmwood Correctional facility and raise the access road and portions of the adjacent parking lot so that when flood waters would enter the Correctional facility site they could not flow out of the "bowl" constructed by the road and parking lot grading. This measure would not only mitigate the existing condition but would eliminate the flooding from that source.

Source 3 – The Main Flow from Under Great Mall Parkway

A total 100-year discharge of 1,200 cfs has been determined to be present at the southern end of the commercial site. This discharge is from overflows of Upper Penitencia Creek and Berryessa Creek. The floodwater flow through the community upstream of Great Mall Parkway, under a culvert under the Parkway and then under another culvert that crosses under the access road to Elmwood Correctional facility.

The approximately 600-foot wide area between I-880 and the Correctional facility is planned to be commercial and specifically new car dealerships. The FEMA 100-year flood designation in this area is AO2 – sheetflow to an average depth of 2 feet.

A typical grading template has been developed for these new care areas. The template would provide for a 165-foot wide building in the east-west direction. This building would be set with its first floor one foot above the 100-year flood elevation. The easterly and westerly areas from the building would go down to an elevation of 19.5 feet and would be used as the conveyance facilities for the flood waters. These are the same areas that would house the automobile stock on the sites. Flood waters could be slightly over 3 feet deep on some of this stock parked in the lowest portions of the grading template. Structures, however, would be high enough.

The flood waters would flow northerly along the commercial site and would enter the existing developed area to the north. Currently there are four places for floodwaters to freely travel in a northerly direction: down Abbott Street, between the two industrial buildings that parallel Abbott Street, between the eastern industrial building and the residential area, and down Palmer Street. The flow down Palmer under existing conditions would account for approximately 80 percent of the total discharge. The flow between the industrial and residential areas would account for approximately 3 percent of the total flow and the flows down Abbott Street and between the industrial buildings would account equally for the remaining 17 percent of the total flow.

Under existing conditions the water surface elevation right at the northerly property line is elevation 20 feet (NGVD) according to the FEMA maps. With 1,200 cfs flowing down the commercial area, the 100-year flood would reach an elevation of approximately 22.4 feet from the Hetch-Hetchy crossing to near the southern end.

The proposed project would entail a regarding of the commercial section as described above and would entail filling the residential development area to an elevation in excess of 22.6 feet NGVD. That elevation was established as it would take that elevation to keep the 83 percent of the 100-year flood moving down Palmer Street and the area between the industrial and residential areas.

The first floors of all structures in the commercial area must be set to an elevation not less than 23.6 feet NGVD.

No pad for any structure may be closer to the northern property line than 200 feet. The same holds for the southern property line. These flow transition areas allow flow to turn where needed unimpeded by the presence of fill for structures.

This plan will keep the floodplain the same on all upstream property owners, on all downstream property owners and will allow the commercial structures to be free from flood damage.

Source 4 – Overflow from Lower Penitencia Creek

If the levee along Lower Penitencia Creek from Sylvia Avenue to the northern Elmwood entrance bridge were assumed removed, a total of 110 cfs would escape from the creek

and flow to the west through the proposed residential and commercial portions of the project.

To prevent this from occurring, it is proposed to mass fill the area next to the SCVWD levees along the west side of the creek. This mass fill would fit in with the raised roadway for the proposed crossing of Lower Penitencia Creek and with the raising of the entire residential area so that first floors of all units are above elevation 23.6 feet NGVD to protect from backwater from the 1,200 cfs flowing through the commercial area from south to north.

As there would be mass fill all the way to the proposed wall along the northern boundary of the Elmwood northerly access road, there would be no need to consider flooding from Lower Penitencia Creek that would flow directly onto the project site or onto the Hetch-Hetchy right-of-way immediately south of the residential portion of the site.

CONCLUSIONS

The construction of the residential units above the floodplain and the mass fill behind the levee on the west side of Lower Penitencia Creek would prevent the creek from directly becoming a source of flooding to the site. The construction of commercial structures that would block not more than 165 feet of the commercial floodplain and then have lower areas for the passage of floodwaters would allow construction to be done according to the City's floodplain management ordinance. The northern 200 feet of building-free area would allow the floodwaters to turn where needed and flow down areas to the north just as they do today. The southern 200 feet of building-free area would allow the floodwaters coming from the culvert under the access road to make a right 90-degree turn and flow in a northerly direction among the commercial properties.

The portion of the project to the east of Abel Street should leave sufficient room for 370 cfs of sheet flow to get through the site at a depth of one foot. All buildings in this portion of the project must have first floor elevations a minimum of 2 feet above natural ground or above the nearest centerline of Abel Street whichever is higher.

These mitigation measures are designed to have flood-free developments and to keep the flood situation the same on all neighboring properties.